Topic: Vertical asymptotes

Question: Find the vertical asymptotes of the function.

$$f(x) = \frac{1}{x^2}$$

Answer choices:

A $x = 1$

B $x = 0$

C $x = \infty$

D $x = -1$

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Solution: B

Vertical asymptotes exist in a function where the function does not exist. In a rational function (fraction), the function doesn't exist where the denominator is equal to 0. Therefore, to find the vertical asymptotes of a rational function, we'll set the denominator equal to 0, and then solve for all possible values of x.

Any x values we find need to be put back into the original function to verify that they don't give back a $0/0$ value. A $0/0$ result is a continuity issue, not a vertical asymptote.

We'll take the denominator of our function and set it equal to 0 and solve for x.

$$x^2 = 0$$

$$x = 0$$

Plugging $x = 0$ back into our original function, we get

$$f(0) = \frac{1}{(0)^2}$$

$$f(0) = \frac{1}{0}$$

Since $f(0) \neq 0/0$, we know that the function has a vertical asymptote at $x = 0$.

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Topic: Vertical asymptotes

Question: Find the vertical asymptotes of the function.

$$f(x) = \frac{x-2}{x^2-3}$$

Answer choices:

A $x = -2$ and $x = 2$

B $x = -3$ and $x = 3$

C $x = -\sqrt{3}$ and $x = \sqrt{3}$

D $x = -\sqrt{2}$ and $x = \sqrt{2}$

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Solution: C

Vertical asymptotes exist in a function where the function does not exist. In a rational function (fraction), the function doesn't exist where the denominator is equal to 0. Therefore, to find the vertical asymptotes of a rational function, we'll set the denominator equal to 0, and then solve for all possible values of x.

Any x values we find need to be put back into the original function to verify that they don't give back a $0/0$ value. A $0/0$ result is a continuity issue, not a vertical asymptote.

We'll take the denominator of our function and set it equal to 0 and solve for x.

$$x^2 - 3 = 0$$

$$x^2 = 3$$

$$x = \pm\sqrt{3}$$

Plugging $x = \sqrt{3}$ back into our original function, we get

$$f\left(\sqrt{3}\right) = \frac{\sqrt{3} - 2}{\left(\sqrt{3}\right)^2 - 3}$$

$$f\left(\sqrt{3}\right) = \frac{\sqrt{3} - 2}{0}$$

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Since $f\left(\sqrt{3}\right) \neq 0/0$, we know that the function has a vertical asymptote at $x = \sqrt{3}$.

Plugging $x = -\sqrt{3}$ back into our original function, we get

$$f\left(-\sqrt{3}\right) = \frac{-\sqrt{3} - 2}{\left(-\sqrt{3}\right)^2 - 3}$$

$$f\left(-\sqrt{3}\right) = \frac{-\sqrt{3} - 2}{0}$$

Since $f\left(-\sqrt{3}\right) \neq 0/0$, we know that the function has a vertical asymptote at $x = -\sqrt{3}$.

In conclusion, we can say that the function has two vertical asymptotes, one at $x = -\sqrt{3}$ and the other at $x = \sqrt{3}$.

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Topic: Vertical asymptotes

Question: Find the vertical asymptotes of the function.

$$f(x) = \frac{2x}{x^2 - 4x + 3}$$

Answer choices:

A $x = 1$ and $x = -3$

B $x = -1$ and $x = -3$

C $x = -1$ and $x = 3$

D $x = 1$ and $x = 3$

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Solution: D

Vertical asymptotes exist in a function where the function does not exist. In a rational function (fraction), the function doesn't exist where the denominator is equal to 0. Therefore, to find the vertical asymptotes of a rational function, we'll set the denominator equal to 0, and then solve for all possible values of x.

Any x values we find need to be put back into the original function to verify that they don't give back a $0/0$ value. A $0/0$ result is a continuity issue, not a vertical asymptote.

We'll take the denominator of our function and set it equal to 0 and solve for x.

$$x^2 - 4x + 3 = 0$$

$$(x - 1)(x - 3) = 0$$

$x = 3$ or $x = 1$

Plugging $x = 3$ back into our original function, we get

$$f(3) = \frac{2(3)}{(3)^2 - 4(3) + 3}$$

$$f(3) = \frac{6}{0}$$

Since $f(3) \neq 0/0$, we know that the function has a vertical asymptote at $x = 3$.

Plugging $x = 1$ back into our original function, we get

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$$f(1) = \frac{2(1)}{(1)^2 - 4(1) + 3}$$

$$f(1) = \frac{2}{0}$$

Since $f(1) \neq 0/0$, we know that the function has a vertical asymptote at $x = 1$.

In conclusion, we can say that the function has two vertical asymptotes, one at $x = 1$ and the other at $x = 3$.

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